ME 533: Energy Conversion

Fall 2022

Instructor
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Class Time: Monday/Wednesday 12:20-2:05PM

Classroom: EPC 206

Office Hours: Mondays 2:30-3:30 PM, or by appointment

Course Description:
Thermodynamic and mechanical aspects of modern energy conversion systems, including traditional systems such as steam power plants, gas turbines and internal combustion engines and refrigeration systems, and renewable systems such as solar, wind, geothermal. Combined heat and power and cogeneration are also considered, as well as economic and environmental aspects of energy conversion.

Grading:

Homework	15%
Exam 1	20%
Exam 2	20%
Project	25%
Participation	10%
Discussion Lead	10%

Homework
Homework includes in-class assignments and assigned problem sets and will count for 15% of the final grade. Homework should be turned in via Blackboard. Late homework will not be accepted.

Homework assignments should be presented in a professional manner. This includes clean, clear, logical work; labeled plots and tables.

Exams
Two exams will be given during the semester. The first will be an in-class exam and will cover material from the first half of the semester. The final exam will be a take home exam.

The final exam will be a report discussing your vision for a sustainable energy future. The report must include citations, calculations to support your vision, a discussion of how your project topic fits (or does not fit) into your vision, and the economic implications of your vision. Details on the report requirements will be given out in class.

All exams are to be done individually. Collaboration of any kind will be grounds for a zero on the exam and possible disciplinary action.

Project
The project will focus on learning about state of the art energy conversion technologies. Groups of 2 or 3 students will work together to research a topic related to a new or advanced energy conversion technology.

Teams will present their technology in class during a mock poster session for the Energy Conversion Conference held mid-semester. Grading will be based on your abstract, poster, presentation and reviews by your fellow classmates. Details on the project will be given in class.

Project Team Sign-up

Participation

Participation includes in-class discussions, asking questions in class, attending office hours, answering questions, and generally being present and making an effort.

Discussion Lead

Teams of 2 will chose a short reading (~5-8 pages) relevant to the topic of day and lead a discussion on the reading. The reading should come from a peer reviewed scientific journal and have been published within the last 5 years. The reading should discuss a state of the art technology, societal, environmental or economic aspect of the topic. Readings should not present a review or overview of the topic.

Readings should be selected a week before the class and 2 questions should also be assigned. The questions and a PDF of the selected reading should be emailed to Prof. Ryan one week ahead of class. Readings and questions will be posted on Blackboard.

Note: You must have different partners and topics for the project and the discussion lead.

Discussion Lead Sign-up

Class Policies:

1. Academic dishonesty will not be tolerated. Students are expected to follow the BU Code of Student Responsibilities: http://www.bu.edu/dos/policies/student-responsibilities/
    a. Any violation of the code will be punishable by possible zero for the assignment or course grade and will be sent to the conduct committee.
2. Attendance: You are expected to be present and engaged during class, however attendance will not be taken. Your attendance and engagement is reflected in the participation portion of the grade.
3. Inclusion: I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.
4. Accommodations for Students with Documented Disabilities: If you are a student with a disability or believe you might have a disability that requires accommodations, requests for accommodations must be made in a timely fashion to Disability & Access Services, 25 Buick St, Suite 300, Boston, MA 02215; 617-353-3658 (Voice/TTY). Students seeking academic accommodations must submit appropriate medical documentation and comply with the established policies and procedures:
   http://www.bu.edu/disability/accommodations/

a. Requests for accommodations must be submitted to Prof. Ryan at least 1 week before an exam.

Course Materials:
Blackboard will be used for all class communications and documents.

Readings:
Selected articles, reports, and book chapters will be assigned throughout class and are posted to Blackboard.

Reference Textbooks:

1. J.W. Tester, E.M. Drake, M.J. Driscoll, M.W. Golay, W.A. Peters, *Sustainable Energy: Choosing Among Option*, MIT Press, Second Edition, 2012.
2. K. Weston, *Energy Conversion,* EBook, http://www.personal.utulsa.edu/~kenneth-weston/.
3. A.W. Culp, *Principles of Energy Conversion*, McGraw-Hill, 1991.
4. Y.A. Cengel, M.A. Boles, *Thermodynamics*, McGraw-Hill, 2002.

Topics:

1. Overview of Energy Conversion
2. Environmental Impacts
3. Thermodynamics Review
4. Vapor Power Cycles
5. Gas Power Cycles
6. Cleaning up fossil fuels
7. The Electric Grid
8. Nuclear Power
9. Wind
10. Solar
11. Ocean/Wave Energy
12. Geothermal
13. Other Renewable Energy Systems
14. Direct Chemical-Electrical Conversion

Course Schedule

A separate course schedule document can be found on Blackboard. You should refer to this for all readings, assignments and due dates. Note that the Course Schedule is a living document and will be updated throughout the semester.